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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

PAK, YONG D

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1652

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06/25/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.		Applicant(s)	
	09/776,191		MADISON ET AL.	
	Examiner		Art Unit	
	Yong D. Pak		1652	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 March 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) See Continuation Sheet is/are pending in the application.
- 4a) Of the above claim(s) 10,43-46,48-55,108,109,115,116,118-120 and 122-126 is/are withdrawn from consideration.

- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,11-13,19,20,34-36,40-42,113 and 114 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Continuation of Disposition of Claims: Claims pending in the application are 1-3,10-13,19,20,34-36,40-46,48-55,108,109,113-116,118-120 and 122-126.

DETAILED ACTION

The petition of March 23, 2007 is being treated as a request for reconsideration. In view of said request, the finality of the previous Office action is withdrawn, rendering the petition moot. A new action on the merits is set forth below.

This application is a CIP of 09/657,986, now issued as U.S. Patent No. 6,797,504.

The amendment filed on October 23, 2006, amending claims 1, 12, 13 and 19 and canceling claim 5, has been entered.

Claims 1-3, 10-13, 19-20, 34-36, 40-46, 48-55, 108-109 113-116, 118-120 and 122-126 are pending. Claims 10, 43-46, 48-55, 108-109, 115-116, 118-120 and 122-126 are withdrawn. Claims 1-3, 11-13, 19-20, 34-36, 40-42 and 113-114 are under consideration.

Priority

Applicant's claim for domestic priority under 35 U.S.C. 119(e) is acknowledged. However, the provisional applications upon which priority is claimed fails to provide adequate support under 35 U.S.C. 112 for claims 11-13 and 34 of this application.

Provisional applications 60/179,982, 60/183,542, 60/213,124, 60/220,970 and 60/234,840 fail to provide adequate support for polypeptides comprising the serine protease domain of MTSP1. Provisional applications 60/179,982 and 60/183,542

describe polypeptides related MTSP3 and provisional application 60/213,124, 60/220,970 and 60/234,840 describe polypeptides related to MTSP4.

Therefore, the effective filing date for purpose of prior art is the filing date of 09/657,986, which is 9/8/2000.

Response to Arguments

Applicant's amendment and arguments filed on October 23, 2006, have been fully considered and are deemed to be persuasive to overcome the rejections previously applied. Rejections and/or objections not reiterated from previous office actions are hereby withdrawn.

Claim Objections

Claims 11-13 and 34 are objected for being drawn to non-elected subject matter. In response to the previous Office Action, applicants have traversed the above rejection. Applicants argue that claims 11-13 and 34 should be retained pending a determination of the allowability of claim 1, which is a linking claim, linking the elected subject matter. Since claim 1 has not been indicated as allowable, the objection is maintained.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-3, 11-12, 13 and claims 19-20, 34-36, 40-42 and 113-114 depending therefrom rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1-3, 11-12, 13 recite the phrase "substantially purified single-chain polypeptide". The metes and bounds of the phrase in the context of the above claims are not clear to the Examiner. It is not clear to the Examiner what is considered as "substantially purified" by the applicants. A perusal of the specification did not provide a clear definition for the above phrase. Without a clear definition, those skilled in the art would be unable to conclude if a polypeptide is a "substantially purified" polypeptide without knowing the metes and bounds of the phrase. Examiner requests clarification of the above phrase.

In response to the previous Office Action, applicants have traversed the above rejection.

Applicants argue that when read in light of the specification, the skilled artisan would understand the meaning of the recitation "substantially purified" and points to page 46, lines 4-15 of the specification for the definition of the phrase "substantially purified". Examiner respectfully disagrees. The specification on page 46, lines 4-15, does not define what applicants mean by "substantially purified", but only describes that "substantially pure means sufficiently homogeneous to appear free of readily detectable impurities as determined by standard methods of analysis". Since there is no clear guidance to one having ordinary skill in the art in qualifying the purity of an enzyme by

ascertaining whether it is free of readily detectable impurities, it is not clear to the Examiner as to how much of a presence of these readily detectable impurities qualifies an enzyme to be "substantially pure". Therefore, those skilled in the art would be unable to conclude what polypeptides are "substantially purified".

Hence the rejection is maintained.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-3, 11, 19-20, 34-36, 40-42 and 113-114 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 1-3, 11, 19-20, 35-36, 40-42 and 113-114 are drawn to a polypeptide consisting of a protease domain or catalytically active fragment thereof of type-II membrane-type serine protease (MTSP) from any source. Claims 11 and 34 limit the MTSP polypeptide to a MTSP1 polypeptide from any source. Therefore, these claims are drawn to a genus of polypeptides having any structure. The specification only teaches four species, amino acids 615-855 of SEQ ID NO:2 (MTSP1), amino acids of 205-437 of SEQ ID NO:4 (MTSP3), amino acids of SEQ ID NO:6 (MTSP4) and amino acids 217-443 of SEQ ID NO:11 (MTSP6). These species are not enough to describe

the whole genus and there is no evidence on the record of the relationship between the structure of the above catalytically active protease domains of SEQ ID NOs: 2, 4, 6 and 11 and the structure of the serine protease domain of any or all MTSP polypeptides or MTSP1 polypeptides. Further, the specification does not describe the structure of a catalytically active fragment of a protease domain of any or all MTSP polypeptide. Therefore, the specification fails to describe a representative species of the genus of polypeptides comprising of a serine protease domain or a catalytically active portion of a MTSP polypeptide.

Given this lack of description of the representative species encompassed by the genus of the claims, the specification fails to sufficiently describe the claimed invention in such full, clear, concise, and exact terms that a skilled artisan would recognize that applicants were in possession of the inventions of claims 1-3, 11, 19-20, 34-36, 40-42 and 113-114.

Applicant is referred to the revised guidelines concerning compliance with the written description requirement of U.S.C. 112, first paragraph, published in the Official Gazette and also available at www.uspto.gov.

In response to the previous Office Action, applicants have traversed the above rejection.

Applicants argue that the claims are fully described by the specification because the structural feature, a single chain protease domain, is present in all members of the genus and is the defining and requisite property and the specification clearly describes

this feature. Examiner respectfully disagrees. The recitation of "protease domain of a MTSP" or "MTSP1" fails to provide a sufficient description of the claimed genus of polynucleotides as it merely describes the functional features of the genus without providing any definition of the structural features of the species within the genus. The CAFC in *UC California v. Eli Lilly*, (43 USPQ2d 1398) stated that: "in claims to genetic material, however a generic statement such as 'vertebrate insulin cDNA' or 'mammalian insulin cDNA,' without more, is not an adequate written description of the genus because it does not distinguish the claimed genus from others, except by function. It does not specifically define any of the genes that fall within its definition. It does not define any structural features commonly possessed by members of the genus that distinguish them from others. One skilled in the art therefore cannot, as one can do with a fully described genus, visualize or recognize the identity of the members of the genus." Similarly with the claimed genus of protease domains, the functional definition of the genus does not provide any structural information commonly possessed by members of the genus which distinguish the species within the genus from other proteins such that one can visualize or recognize the identity of the members of the genus.

Applicants also argue that the claims are fully described because the specification describes known MTSPs and identifies the protease domains thereof, unknown MTSPs and its protease domains. Examiner respectfully disagrees. The claims are not limited to specific protease domains of specific MTSP proteins, but the claims are drawn to polypeptides comprising any protease domains or any or all

catalytically active fragments of said protease domains of any or all MTSP or any or all MTSP1, including any or all recombinants, variants and mutants of said MTSP or MTSP1. As discussed in the written description guidelines, the written description requirement for a claimed genus may be satisfied through sufficient description of a representative number of species by actual reduction to practice, reduction to drawings, or by disclosure of relevant, identifying characteristics, i.e., structure or other physical and/or chemical properties, by functional characteristics coupled with a known or disclosed correlation between function and structure, or by a combination of such identifying characteristics, sufficient to show the applicant was in possession of the claimed genus. A representative number of species means that the species which are adequately described are representative of the entire genus. **Thus, when there is substantial variation within the genus, one must describe a sufficient variety of species to reflect the variation within the genus.** Satisfactory disclosure of a representative number depends on whether one of skill in the art would recognize that the applicant was in possession of the necessary common attributes or features of the elements possessed by the members of the genus in view of the species disclosed. For inventions in an unpredictable art, adequate written description of a genus which embraces widely variant species cannot be achieved by disclosing only one species within the genus. In the instant case the claimed genera of the claims are drawn to species which are widely variant in structure. The genus of the claims are structurally diverse as it encompasses any catalytically active protease domains of any or all MTSP or MTSP1, excepting having serine protease activity. As such, neither the description of

solely structural features present in all members of the genus is sufficient to be representative of the attributes and features of the entire genus.

Applicants also argue that the specification provides "relevant, identifying characteristics" of a representative number of species of the claimed genus. Examiner respectfully disagrees. The claims are drawn to polypeptides comprising any protease domains or any or all catalytically active fragments of said protease domains of any or all MTSP or any or all MTSP1, including any or all recombinants, variants and mutants of said MTSP or MTSP1. The claims are drawn to polypeptides having any structure and therefore, the claims are drawn to a genus encompassing species having substantial variation and fails to describe a representative number of species. As discussed in the written description guidelines, the written description requirement for a claimed genus may be satisfied through sufficient description of a representative number of species by actual reduction to practice, reduction to drawings, or by disclosure of relevant, identifying characteristics, i.e., structure or other physical and/or chemical properties, by functional characteristics coupled with a known or disclosed correlation between function and structure, or by a combination of such identifying characteristics, sufficient to show the applicant was in possession of the claimed genus. A representative number of species means that the species which are adequately described are representative of the entire genus. **Thus, when there is substantial variation within the genus, one must describe a sufficient variety of species to reflect the variation within the genus.** Satisfactory disclosure of a representative number depends on whether one of skill in the art would recognize that the applicant

was in possession of the necessary common attributes or features of the elements possessed by the members of the genus in view of the species disclosed. For inventions in an unpredictable art, adequate written description of a genus which embraces widely variant species cannot be achieved by disclosing only one species within the genus. In the instant case the claimed genera of the claims are drawn to species which are widely variant in structure. The genus of the claims are structurally diverse as it encompasses any catalytically active protease domains of any or all MTSP or MTSP1, excepting having serine protease activity. As such, neither the description of solely structural features present in all members of the genus is sufficient to be representative of the attributes and features of the entire genus.

Applicants also argue that the claims are fully described because specification provides at least a dozen examples of protease domains of MTSPs. Examiner respectfully disagrees. The claims are not drawn to the specific protease domains of the MTSPs disclosed in the specification, but to polypeptides consisting of any protease domains or any or all catalytically active fragments of said protease domains of any or all MTSP or any or all MTSP1, including any or all recombinants, variants and mutants of said MTSP or MTSP1. In view of the widely variant species encompassed by the genus, the species disclosed in the specification is not enough and does not constitute a representative number of species to describe the whole genus of any or all variants, recombinant and mutants of any or all polypeptides having serine protease activity isolated from any or all source, including any or all variants, recombinants and mutants thereof, and there is no evidence on the record of the relationship between the structure

of the protease domain of the specific MTSPs disclosed in the specification and the structure of any or all recombinant, variant and mutant of any or all polypeptides having serine protease activity. Therefore, the specification fails to describe a representative species of the genus comprising any or all polypeptides having serine protease activity, including any or all variants, recombinants and mutants thereof.

Hence the rejection is maintained.

Claims 1-3, 11, 19-20, 34-36, 40-42 and 113-114 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a polypeptide consisting of amino acids 615-855 of SEQ ID NO:2, does not reasonably provide enablement for a polypeptide comprising any protease domain of any type II membrane type serine protease (MTSP) or MTSP1 or a catalytically active portion thereof. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims.

Factors to be considered in determining whether undue experimentation is required are summarized in In re Wands 858 F.2d 731, 8 USPQ2nd 1400 (Fed. Cir. 1988). They include (1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims.

Claims 1-3, 11, 19-20, 35-36, 40-42 and 113-114 are drawn to a polypeptide consisting of a protease domain or catalytically active fragment thereof of a type-II membrane-type serine protease (MTSP) from any source. Claims 11 and 34 limit the MTSP polypeptide to a MTSP1 polypeptide from any source. Therefore, these claims are drawn to polypeptides having undefined structure.

The scope of the claims is not commensurate with the enablement provided by the disclosure with regard to the extremely large number of polypeptides comprising a protease or catalytically active domain broadly encompassed by the claims. Since the amino acid sequence of a protein determines its structural and functional properties, predictability of which changes can be tolerated in a protein's amino acid sequence and obtain the desired activity requires a knowledge of and guidance with regard to which amino acids in the protein's sequence, if any, are tolerant of modification and which are conserved (i.e. expectedly intolerant to modification), and detailed knowledge of the ways in which the proteins' structure relates to its function. However, in this case the disclosure is limited to the polypeptide comprising amino acids 615-855 of SEQ ID NO:2, or the amino acids of SEQ ID NO:50.

It would require undue experimentation of the skilled artisan to make and use the claimed polypeptides. The specification is limited to teaching the use of polypeptide comprising amino acids 615-855 of SEQ ID NO:2 or the amino acids of SEQ ID NO:50 but provides no guidance with regard to the making of variants and mutants or with regard to other uses. In view of the great breadth of the claim, amount of experimentation required to make the claimed polypeptides, the lack of guidance,

working examples, and unpredictability of the art in predicting function from a polypeptide primary structure, the claimed invention would require undue experimentation. As such, the specification fails to teach one of ordinary skill how to use the full scope of the polypeptides encompassed by the claims.

While enzyme isolation techniques, recombinant and mutagenesis techniques are known, and it is routine in the art to screen for multiple substitutions or multiple modifications as encompassed by the instant claims, the specific amino acid positions within a protein's sequence where amino acid modifications can be made with a reasonable expectation of success in obtaining the desired activity/utility are limited in any protein and the result of such modifications is unpredictable. In addition, one skilled in the art would expect any tolerance to modification for a given protein to diminish with each further and additional modification, e.g. multiple substitutions.

The specification does not support the broad scope of the claims which encompass all modifications and variants of a protease or catalytically active domain or modifications of amino acids 615-855 of SEQ ID NO:2 because the specification does not establish: (A) regions of the protein structure which may be modified without affecting MTSP/serine protease activity; (B) the general tolerance of MTSP to modification and extent of such tolerance; (C) a rational and predictable scheme for modifying any amino acid residue with an expectation of obtaining the desired biological function; and (D) the specification provides insufficient guidance as to which of the essentially infinite possible choices is likely to be successful.

Thus, applicants have not provided sufficient guidance to enable one of ordinary skill in the art to make and use the claimed invention in a manner reasonably correlated with the scope of the claims broadly including protease or catalytically active domains of MTSP with an enormous number of amino acid modifications of the MTSP polypeptides and of amino acids 615-855 of SEQ ID NO:2. The scope of the claims must bear a reasonable correlation with the scope of enablement (*In re Fisher*, 166 USPQ 19 24 (CCPA 1970)). Without sufficient guidance, determination of the serine protease domain or the catalytically active domain of MTSP having the desired biological characteristics is unpredictable and the experimentation left to those skilled in the art is unnecessarily, and improperly, extensive and undue. See *In re Wands* 858 F.2d 731, 8 USPQ2d 1400 (Fed. Cir, 1988).

In response to the previous Office Action, applicants have traversed the above rejection.

Applicants argue that the claims are enabled because the level of skill in the art is high and the specification teaches that MTSP polypeptides constitute a recognized well-known and well characterized family of serine protease and the specification describes the protease domain of a number of MTSP family members, such as conserved features of MTSP protease domains. Examiner respectfully disagrees. The scope of the claims, which are drawn to polypeptides comprising any protease domains or any or all catalytically active fragments of said protease domains of any or all MTSP or any or all MTSP1, including any or all recombinants, variants and mutants of said MTSP or MTSP1, is not commensurate with the enablement provided by the disclosure

with regard to the extremely large number of polypeptides comprising a protease or catalytically active domain broadly encompassed by the claims. Even though the structure of some MTSP are known, the claims are drawn to any or all serine domains and catalytically active fragments of any or all protease domains of any or all MTSP or MTSP1. As discussed above, predictability of which changes can be tolerated in a protein's amino acid sequence and obtain the desired activity requires a specific knowledge of and guidance with regard to which specific amino acids in the protein's sequence, can be modified such that the modified polypeptide continues to have said claimed activity. It is this specific guidance that applicants do not provide. While the art may teach in general the structure of MTSP conserved amino acid sequences, protease domains, X-ray crystal structure and etc, such teachings will not reduce the burden of undue experimentation on those of ordinary skill in the art.

Applicants also argue that the claims are enabled because the knowledge, regarding MTSP proteins, of those skilled in the art is high. The Examiner respectfully disagrees. The claims are drawn to polypeptides comprising any protease domains or any or all catalytically active fragments of said protease domains of any or all MTSP or any or all MTSP1, including any or all recombinants, variants and mutants of said MTSP or MTSP1. Since the amino acid sequence of the protein determines its structural and functional properties, predictability of which changes can be tolerated in a protein's amino acid sequence and obtain the desired activity requires a knowledge of and guidance with regard to which amino acids in the protein's sequence, if any, are tolerant of modification and which are conserved (i.e. expectedly intolerant to modification), and

detailed knowledge of the ways in which the proteins' structure relates to its function. In addition, the art does not provide any teaching or guidance as to which amino acids within a serine protease can be modified and which ones are conserved such that one of skill in the art can make the recited polypeptides having serine protease activity and the general tolerance of serine proteases to structural modifications and the extent of such tolerance. The art clearly teaches that changes in a protein's amino acid sequence to obtain the desired activity without any guidance/knowledge as to which amino acids in a protein are required for that activity is highly unpredictable. At the time of the invention, there was a high level of unpredictability associated with altering a polypeptide sequence with an expectation that the polypeptide will maintain the desired activity. For example, Branden et al. (Introduction to Protein Structure, Garland Publishing Inc., New York, page 247, 1991) teach that (1) protein engineers are frequently surprised by the range of effects caused by single mutations that they hoped would change only one specific and simple property in enzymes, (2) the often surprising results obtained by experiments where single mutations are made reveal how little is known about the rules of protein stability, and (3) the difficulties in designing de novo stable proteins with specific functions.

Applicants argue that the specification discloses working examples, thus a person skilled in the art has sufficient guide in making the claimed polypeptides. Examiner respectfully disagrees. Even though the structure of some MTSP are taught, the claims are not only drawn to polypeptides comprising catalytically active fragments of only MTSP1, MTSP3, MTSP4 and MTSP6, but to any or all mutants, variants and

recombinants of any MTSP. Without specific guidance, those skilled in the art will be subjected to undue experimentation of making and testing each of the enormously large number of mutants that results from such experimentation. While the art may teach in general the structure of MTSP, conserved amino acid sequences, and etc, such teachings will not reduce the burden of undue experimentation on those of ordinary skill in the art.

Hence the rejection is maintained.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

- (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
- (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
- (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3 and 19-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Dawson et al.

Claims 1-3 and 19-20 are drawn to a polypeptide consisting of a serine protease domain of MTSP or catalytically active fragments thereof.

Dawson et al. (US Patent 5,465,833 -form PTO-892) discloses a polypeptide consisting of serine protease domain or a catalytically active fragment thereof of a MTSP protein, hepsin (Figure 1). Therefore, the reference of Dawson et al. anticipates claims 1-3 and 19-20.

Claims 1-3, 11-13, 19-20, 34-36, 40-42 and 113-114 are rejected under 35 U.S.C. 102(b) as being anticipated by Takeuchi et al.

Claims 1-3, 11-13, 19-20 and 34 are drawn to a polypeptide comprising fragment consisting of a serine protease domain of MTSP having the characteristics recited in the claims. Claims 35-36 are drawn to a conjugate comprising a polypeptide comprising a serine protease domain of MTSP and a targeting agent. Claims 40 -42 and 113-114 are drawn to a solid support comprising a polypeptide comprising a serine protease domain of MTSP.

Takeuchi et al. (Reference IJ : PTO-1449) teaches a polypeptide comprising a fragment consisting of a serine protease domain that is 100% identical to amino acids 615-855 of SEQ ID NO:2 of the instant invention (page 11060, 2nd full paragraph). Takeuchi et al. discloses a purified activated protease domain, comprising amino acids 615-855 of SEQ ID NO:2, confirmed by an N-terminal sequence of the purified, activated protease domain yielding the expected VVGGT sequence (Figure 3 and right column on page 11057). The MTSP of Takeuchi et al. is not expressed on normal endothelia cells (page 11054, last paragraph and page 11055, 2nd full paragraph), is of

human origin (Figure 1), consists essentially of the protease domain having catalytic activity (page 11060, 2nd full paragraph), and is expressed in tumor cells (page 11055, top paragraph).

Takeuchi et al. teaches a catalytically active polypeptide comprising the serine protease domain linked to a His-tag (page 11055, 3rd full paragraph, page 11057, 4th full paragraph). Takeuchi et al. also teaches a solid support comprising said polypeptide (page 11057, 4th full paragraph and Figure 5). Therefore, the teaching of Takeuchi et al. anticipates claims 1-3, 11-13, 19-20, 34-36, 40-42 and 113-114.

Examiner notes that the contents of the reference were made public at the National Academy of Sciences colloquium held February 20-21, 1999 (see top of reference).

In response to the previous Office Action, applicants have traversed the above rejections.

Applicants argue that Takeuchi et al. does not anticipate the instant claims because the instant claims are drawn to a polypeptide that consists of a protease domain or catalytically active portion thereof. Examiner respectfully disagrees. In addition to the full-length MT-SP1, Takeuchi et al. also discloses a purified activated protease domain, consisting of amino acids 615-855 of SEQ ID NO:2, confirmed by an N-terminal sequence of the purified, activated protease domain yielding the expected VGGT sequence (Figure 3 and right column on page 11057). Therefore, said purified, activated protease domain anticipates the instant claims.

Applicants also argue that Takeuchi et al. does not anticipate the instant claims because the claimed polypeptide is a single chain polypeptide. Examiner respectfully disagrees. As discussed above, Takeuchi et al. discloses a purified activated protease domain, consisting of amino acids 615-855 of SEQ ID NO:2, confirmed by an N-terminal sequence of the purified, activated protease domain yielding the expected VVGGT sequence (Figure 3 and right column on page 11057).

Hence the rejections are maintained.

Claim Rejections - 35 USC § 102/103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The following is a quotation of 35 U.S.C. 103(a), which forms the basis for all obviousness rejections, set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 11-13 and 34 rejected under 35 U.S.C. 103(a) as obvious over
O'Brien et al.

Claims 1-3, 11-13 and 34 are drawn to a polypeptide comprising a serine protease domain of MTSP.

O'Brien et al. (U.S. Patent No. 5,972,616 – reference P- PTO 1449) teaches a polypeptide having 100% identity to the full length MTSP1 of SEQ ID NO:2 of the instant invention (SEQ ID NO:2, columns 19-24). O'Brien et al. teaches a serine protease domain having proteolytic activity that is 100% identical to amino acids 615-855 of SEQ ID NO:2 (Figure 2, Figure 10 and SEQ ID NO:14). Further, O'Brien et al. teaches a method of expressing polypeptides via a vector in host cells. O'Brien et al. also teaches that the protease domain could be released and used as a diagnostic which has the potential for a target for therapeutic intervention (Column 15, lines 35-38). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to express the protease domain of SQ ID NO:14 and purify the polypeptide. The motivation of making such a polypeptides is to use it as a diagnostic which has the potential for a target for therapeutic intervention. One of ordinary skill in the art would have had a reasonable expectation of success since expression of a heterologous polypeptide is routine in the art and O'Brien et al. teaches how to express heterologous polypeptides.

Therefore, the above reference renders claims 1-3, 11-13 and 34 prima facie obvious to one of ordinary skill in the art.

In response to the previous Office Action, applicants have traversed the above rejections.

Applicants also argue that one of skill in the art would recognize the disclosure of the polypeptide of O'Brien as not disclosing a single chain polypeptide. Examiner respectfully disagrees. A single chain polypeptide is one sequence of amino acids beginning with a carboxyl end and terminating with an amino end, wherein the amino acids are connected via peptide bonds. Therefore, the protease domain obtained from O'Brien et al. can be construed as a single chain polypeptide.

Applicants also argue that O'Brien et al. provides no teaching or suggestion of smaller fragments having serine protease activity because it does not teach how to make a single chain polypeptide that has serine protease activity. Examiner respectfully disagrees. O'Brien et al. teaches a method of expressing polypeptides via a vector in host cells. It is well within the skill available in the art to purify the protease domain since O'Brien et al. identifies the protease domain. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to express the protease domain of SQ ID NO:14 and purify the polypeptide. The motivation of making such a polypeptides is to use it as a diagnostic which has the potential for a target for therapeutic intervention. One of ordinary skill in the art would have had a reasonable expectation of success since expression of a heterologous polypeptide is routine in the art and O'Brien et al. teaches how to express heterologous polypeptides.

Applicants again argue that at the time of filing the instant application, one of skill in the art would not have had a reasonable expectation of success to express the protease domain because art evidences that a single-chained polypeptide would not

have been expected to have protease activity. Examiner respectfully disagrees. The claims are drawn to a polypeptide comprising a fragment consisting of a protease domain of SEQ ID NO:2. Therefore, said polypeptide being a single-chained polypeptide is an inherent property of said polypeptide since two polypeptides having identical structure will have identical function and physical and chemical properties.

Hence the rejections are maintained.

Claims 35-36, 40-42 and 113-114 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Brien et al.

Claims 35-36 are drawn to a conjugate comprising a polypeptide comprising a serine protease domain of MTSP and a targeting agent. Claims 40-42 and 113-114 are drawn to a solid support comprising a polypeptide comprising a serine protease domain of MTSP.

O'Brien et al. (U.S. Patent No. 5,972,616 – reference P- PTO 1449) teaches a polypeptide having 100% identity to the full length MTSP1 of SEQ ID NO:2 of the instant invention, as discussed above. O'Brien et al. also teaches that the protease domain could be released and used as a diagnostic which has the potential for a target for therapeutic intervention (Column 15, lines 35-38).

O'Brien et al. also teaches method of making fragments of SEQ ID NO:2 (Column 9, lines 22-55). O'Brien et al. teaches said fragments linked to another polypeptide (Column 9, lines 54-55) and conjugated to bridging molecules (Column 6,

lines 27-39) for detecting the polypeptide. Assays using polypeptides linked to the molecules taught by O'Brien et al. utilize solid supports.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to make a polypeptide comprising of the serine protease domain of SEQ ID NO:2 taught by O'Brien et al. and to make conjugates and solid support comprising of a polypeptide comprised of the serine protease domain of SEQ ID NO:2. The motivation of making such a polypeptides is to use it as a diagnostic which has the potential for a target for therapeutic intervention. The motivation of making conjugates and solid supports comprising of said polypeptide is to use the conjugate and solid support in a variety of diagnostic assays. One of ordinary skill in the art would have had a reasonable expectation of success making fragments of a polypeptide is routine in the art and O'Brien et al. teaches how to make fragments of SEQ ID NO:2. One of ordinary skill in the art would have had a reasonable expectation of success in diagnostic assays using conjugates and solid supports comprising a polypeptide is very well known, as taught by O'Brien et al.

Therefore, the above references render claims 35-36 and 40-42 *prima facie* obvious to one of ordinary skill in the art.

In response to the previous Office Action, applicants have traversed the above rejections. Applicants argue that the teachings of O'Brien et al. does not result in the instantly claimed compositions because O'Brien et al. does not teach or suggest a single chain polypeptide that includes a MTSP protease domain where the polypeptide

does not include any additional MTSP portions and the polypeptide has serine protease activity. O'Brien et al. does teach or suggest a single chain polypeptide comprising a MTSP portion, wherein the MTSP portion is a protease domain and wherein the MTSP portion has serine protease activity and wherein the MTSP portion is the only portion of the polypeptide because O'Brien et al. identifies the serine protease domain and one having ordinary skill in the art at the time the invention was filed would have been motivated to purify the serine protease domain of O'Brien et al. as discussed above.

Hence the rejection is maintained.

Claims 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Brien et al. and Estell et al. in view of Takeuchi et al.

Claims 19-20 are drawn to a polypeptide comprising the serine protease domain of a MTSP wherein free Cys residues are substituted with Ser residues.

O'Brien et al. teaches a serine protease domain of a MTSP polypeptide, as discussed above.

The reference of O'Brien et al. does not teach a serine protease domain of a MTPSP polypeptides wherein free Cys residues have been replaced with Ser residues.

It is well known in the art that proteins form disulfide bonds via the SH groups of Cys residues. Upon making a polypeptide comprising a serine protease domain, a Cys residue which normally forms disulfide bonds in the full length polypeptide may be left free. For example, Takeuchi et al. (Reference IJ : PTO-1449) teaches that Cysteine at

position 731 of SEQ ID NO:2 normally forms a disulfide bond with a Cys residue in the pro-protease domain (see page 11060, top left paragraph and Figures 1 and 2).

Cys residues are sensitive to oxidation due to their SH side group. Estell et al. (U.S. Patent No. 5,346,823) teaches that Cys residues replaced with Ser residues to decrease a polypeptide's susceptibility to oxidation (Abstract and Column 10, lines 34-38). Ser residues have similar side chains as Cys residues and substitution of a Cys residue with a Ser residue is a conservative substitution.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to replace free Cys residues in the protease domain taught by O'Brien et al. with a Ser residue. One of ordinary skill in the art would be motivated to make such a change in order to enhance stability of the polypeptide. One of ordinary skill in the art would have had a reasonable expectation of success since Estell et al. teaches successful decrease of a protein's susceptibility to oxidation by substituting residues sensitive to oxidation with conservative substitutions.

Therefore, the above references render claims 1 and 16, 18-20, 34 and 137 *prima facie* obvious to one of ordinary skill in the art.

In response to the previous Office Action, applicants have traversed the above rejections. Applicants argue that the combination of the teachings of O'Brien et al. with the teachings of Estell et al., and Takeuchi et al. does not result in the instantly claimed methods because O'Brien et al. does not teach or suggest a single chain polypeptide that includes a MTSP protease domain where the polypeptide does not include any

additional MTSP portions and the polypeptide has serine protease activity and that neither Takeuchi et al. nor Estell et al. remedy the defects of O'Brien et al. First, the claims are product claims and not method claims. Second, O'Brien et al. does teach or suggest a single chain polypeptide comprising a MTSP portion, wherein the MTSP portion is a protease domain and wherein the MTSP portion has serine protease activity and wherein the MTSP portion is the only portion of the polypeptide because O'Brien et al. identifies the serine protease domain and one having ordinary skill in the art at the time the invention was filed would have been motivated to purify the serine protease domain of O'Brien et al. as discussed above.

Applicants argue that Takeuchi et al. teaches that every cysteine residue of the protein is disulfide bonded and therefore Takeuchi et al. does not teach or suggest an MTSP protease domain having a free Cys residue. Examiner respectfully disagrees. Figure 4 applicants are referring to illustrate disulfide bonds of cysteine residues of the full length MTSP, for example, the Cys at position 830 is disulfide bonded to Cys at position 191.

Hence the rejection is maintained.

None of the claims are in condition for allowance.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yong Pak whose telephone number is 571-272-0935. The examiner can normally be reached 6:30 A.M. to 5:00 P.M. Monday through Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ponnathapu Achutamurthy can be reached on 571-272-0928. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-1600.

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Yong D. Pak
Patent Examiner 1652